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ABSTRACT

A study was conducted to examine whether improved and more intensive teaching of conceptualization and abstract reasoning skills could be a factor in the improvement of reading comprehension. Subjects were 48 high school sophomores reading at or below grade level, evenly divided in experimental and control groups, from four intact classes. A curriculum devised for the experimental group comprised diverse facets of abstract reasoning skills and was taught over a 5-week period. Pretesting and posttesting were done with a standardized reading comprehension test. Results indicated a statistically significant correlation between conceptualization and reading comprehension. The findings suggest the need for (1) an experimental study with random distribution to establish causality, (2) a test for measuring conceptualization directly and adequately, and (3) an expansion of the experimental curriculum. (FL)

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Conceptualization, Abstract Skills and Reading Comprehension

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Running head: Conceptualization and Comprehension

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Abstract

On the heels of declining reading scores in the 1970's, it has been alleged that high school students have deteriorated in abstract reasoning skills. This project hypothesized a correlation between conceptualization and reading comprehension. A quasiexperimental, correlational study was made, using the analysis of covariance with pretest and posttest. Subjects were 48 high school students reading at or below grade level, evenly divided in experimental and control groups, from four intact classes. A curriculum was devised for the experimental group, comprising diverse facets of abstract skills, and taught over a five week period. The posttest established that $F = 4.42$ ($p < .05$), thus validating a statistically significant correlation of conceptualization and reading comprehension. An attitudinal scale indicated positive motivation for both teacher and students. The results suggest the need for an experimental study with random distribution to establish causality; a test should be available for measuring conceptualization directly and adequately, at every age and grade level; and the curriculum used should be expanded, with a longer-term project.

Conceptualization, Abstract Skills and Reading Comprehension

Throughout the 1970's concern was expressed nationwide that SAT and reading scores were declining steadily and alarmingly. In the past several years it appears that those scores may have bottomed out and even begun to rise slightly, especially at primary levels. Now, however, the feeling expressed is that whatever improvement is apparent may be restricted largely to literal decoding of words and apperception of facts, without a corresponding growth in comprehension of meanings, ideas, and cognitive relations, reasoning ability, and values, particularly at the secondary level. Indeed, it is charged that "inferential reasoning skills of high school students have deteriorated" (Maeroff, 1984). In short, students have improved in "low-level" reading ability, but not in "high-level" ability (Rubin, 1981), which is, after all, the sine qua non for a truly literate society. To put it bluntly, perhaps we are simply "teaching for the test" better, a Sophistic rather than a philosophical approach.

It was the intent of the current study to examine whether improved and more intensive teaching of conceptualization and abstract skills could be a factor in the improvement of reading comprehension in depth. The hypothesis was that there would be a significant corre-

lation between abstract reasoning and reading ability, as measured by standardized reading test scores. Such test scores may indeed be "low-level," as Rubin maintains, i.e. calculated by technical considerations and thus somewhat unsuited for measuring abstract skills. However, there appears to be a dearth of "high-level" criteria available for valid measurement of such skills. I could not find in Buros any published test that would measure conceptualization to any great extent.

In addition to this paucity of tests and measurements of abstract skills, a review of the literature indicated considerable lack or inadequacy of curricular material for the purpose of this study. Most of the studies extant focus on the fields of science and mathematics, where formalistic reasoning is clearly central. Those studies which do investigate conceptualization in language communication and reading comprehension tend to zero in on single facets of formal reasoning, such as syllogism (Wolf & Shigaki, 1978), conditional reasoning (Hidi & Bereiter, 1981), causality (Schustack & Sternberg, 1979), and analogy (Hayes & Tierney, 1982).

The curriculum involved in this study was intended to be broad enough in scope to include such areas as verbal and nonverbal inference; implication and inference; causality; redundancies; categorization; sequence and degrees; analogies; differentiation; anagrams;

word completion; fallacies, irrelevancies, and non sequiturs; inductive-deductive reasoning; negative inferences; letter and number patterns; syntactical cloze passages; and scanning (in no specific order). It entailed some overlapping, but that can be useful as reinforcement of learning. This curriculum was devised by the author of this study for the purpose of the study. It should be patent that such a nonconventional curriculum, in the nature of the case, necessitates modifications in methodology of teaching for effective implementation, such as less emphasis on textbooks and uniform curriculum, in favor of more analysis, questioning, discussion, and debate.

This study compared an experimental group with a control group. The groups were compared in terms of raw scores on pretest and posttest, using the analysis of covariance. The independent variable was the method and curriculum of instruction, and the dependent variable was the score on the posttest.

Method

Subjects

Subjects were 48 sophomore students in four "regular" Regents English classes in a New York City high school, with an average age about 15, in an F:M ratio about 5:4, with varied racial and ethnic backgrounds.

Two of the four classes comprised the experimental group, taught by one teacher (24 subjects), and the other two, each taught by a different teacher, constituted the control group (24 subjects).

Procedure

Initially about 120 students were involved in the study. Some were transferred or frequently absent from their classes, or absent for the posttest, or newly admitted during the project, and these were eliminated from the final results. The subjects were in intact classes, so that a quasiexperimental, correlational study was made. 48 of the students were identified as subjects, by the following criteria: (1) pretested and posttested; (2) attended class at least 80% of the time; (3) scored at or below grade level on the pretest.

The reading comprehension part of the Nelson Reading Test, Form 3, Level C, was used both for pretest, at the end of February,

and posttest, in early April 1984, for all four classes. An analysis of covariance of the posttest scores was made, using the pretest scores as the covariate.

I restricted the study to those who scored at or below grade level on the pretest, in both experimental and control groups. The students were chronologically at the level of 10.6 - 10.8 at the time of this study (February - April), so I selected the nearest Raw Score (RS) of 28, representing Grade Equivalent (GE) 10.6, on the test scale of RS 1 - 34, as the ceiling for all pretestees. The next higher RS, 29, represented GE 11.0. Thus, the experimental group settled on now consisted of 24 subjects, with pretest RS 11 - 28, and the control group also comprised 24 subjects, with pretest RS 15 - 28.

The hypothesis implied a correlation of abstract skills and conceptualization with the level of reading comprehension. This entailed a separate curriculum embodying varying facets of logical, abstract skills, which was taught in 15 discrete exercises to the experimental group (some entailing more than one lesson), in addition to the conventional curriculum of spelling and vocabulary words, grammar, and literature (somewhat reduced and supplemented by words and material from the curricular exercises), whereas the curriculum

of the control group was basically standard. The teacher of the experimental group devoted 18 class periods of 40 minutes each to the project curriculum, for a total of 12 hours. Homework was also entailed.

Materials

The Nelson Reading Test, Form 3, Level C, comprised the measuring instrument used.

As noted above (pp. 3 - 4), the curriculum was especially devised for this study. Much of it utilized the store of materials and approaches extant, e.g., anagrams, syntactical cloze passages, scanning, etc., but some of it may be fairly original, e.g., implication and inference, sequence and degrees, redundancies, etc. The intent of this curriculum was to bring all this material together. All of it in toto was intended to make a frontal attack on the student's mind with demands from many angles for keener abstract thinking. The curriculum was presented in a form intended for convenient duplication and replication.

Results

An analysis of covariance of the posttest scores, using the pretest scores as covariate, and with a directional hypothesis, showed (N = 48) that $F = 4.42$ ($p < .05$), thus indicating a statistically significant correlation of abstract skills and conceptualization with the level of reading comprehension, as measured by a standardized reading test, for high school sophomores in Regents English classes who are reading just at or below grade level. The results of the project therefore appear to have validated the hypothesis, at least to that extent.

The mean scores are as follows: experimental group, pretest RS 24.71, GE 9.1; posttest RS 26.17, GE 9.9. Control group, pretest RS 25.29, GE 9.5; posttest RS 24.58, GE 9.1.

Discussion

Naturally I find it gratifying that the hypothesis in this project seems to have been validated. However, there are points to be raised and suggestions to be made.

1. I noted above (p. 6) that the study was restricted to those who scored at or below grade level on the pretest, in both experimental and control groups. This was because the posttest scores suggested on their face that those who ranked high on the pretest tended to remain static or drop slightly on the posttest, whereas those who scored low on the pretest tended to score higher on the posttest. I concluded that this was probably due primarily to two factors: (a) The "ceiling effect," whereby a subject who initially scores at the top ranking of a test simply has no place to go but remain there or drop. This effect is established by the 12.9 maximum grade level achievable with a perfect score. (b) Such tests as the Nelson, MAT, and CAT are probably intended primarily for diagnosis of reading problems and retardation, and are certainly utilized commonly for that purpose. I believe, therefore, that such tests are more valid and useful as measuring instruments for those reading below grade level than for those above it. It would seem helpful, therefore, to use a comprehension test extending at least to the 14th year for such students.

The teacher of a sophomore honors class pointed out that the measuring procedure I used would have little or no meaning for those students; they simply could not show measurable improvement commensurate with their ability.

2. An instrument is needed for testing and measuring abstract skills and conceptualization per se, not just general reading comprehension, mostly "low-level." The only validity claimed in this project is with regard to the latter, apparently in correlation with the former. Validity must "mean that a test is really measuring what it claims to be measuring to accomplish a specific purpose with a specific group of people" (Crowl, 1983). I would hope that material used in this curriculum, such as the story on implication and inference (Cole, 1983), might provide grist for the mill of conceptual measurement.

3. This study was limited to high school sophomores. More investigation is needed at both higher and lower age levels. High school seniors and certainly college entrants and students should be tested specifically for their ability to think and reason conceptually.

At the other end of the age scale, review of the literature indicates that efforts are being made to encourage abstract thinking in junior high school and even elementary school students (Hansen & Pearson, 1980, Wolf & Shigaki, et al.). Piagetian educators maintain that certain abstract skills can be discerned at least as early as 2 - 3

years old and should be encouraged (Sinclair & O'Brien, 1979). I would tend to agree.

4. This project was perforce a quasiexperimental study, having to rely on intact classes for subjects. An experimental study should be made using random assignments, in hopes of establishing not just correlation, but causality.

5. The project, exclusive of pretesting and posttesting, lasted only about 5 weeks (2/28 - 4/3), during which time there was particularly bad weather limiting attendance, and several days' absence by the teacher due to illness. I was hopeful from the outset that the hypothesis could be validated but was leery of the likelihood of this in such a short span of time. In view of the results achieved under these conditions, I would recommend that the curriculum be expanded and a longer-term project be undertaken.

6. Teaching methodology must be adapted to the philosophy of the curriculum. The curriculum used in this project departs substantially from convention in at least two respects: (a) It is open-ended in its questioning approach rather than closed, as in multiple-choice examples, and is thus evocative of discussion and debate. (b) It is basically inductive rather than deductive (albeit not antithetically), in consonance with scientific method, proceeding as often as possible from the concrete to the abstract, the specific to the general, the instance to the category. This theme is developed in the Teacher's

Introduction to the curriculum. The underlying philosophy is basically Socratic rather than didactic.

My personal bias probably shows, in that my M.A. was in philosophy, and I taught that subject in college. Some teachers might need some special training in this curriculum, with its distinctive philosophy and methodology. I consider it fortunate that the teacher of the experimental group (who had majored in English and math) was able to grasp the spirit of this approach quickly and taught the curriculum willingly, expertly, conscientiously, and effectively, thus indicating that replication is feasible.

7. Motivation is clearly contributory to the effectiveness of any curriculum or methodology. This project included a simple, informal attitudinal scale to be rated by the teacher for each of the fifteen exercises (Table 1). The teacher was to make a discrete (and discreet!) evaluation of the general reaction to each exercise, and a self-evaluation of the teacher's own reaction.

The reactions were to be rated by the teacher as follows: Enthusiasm (great), acceptance (good), tolerance (fair), and dislike (poor). For assessing values of the four attitudes in order, I assigned the numbers +4, +3, +2, and +1 respectively. The mean for the students' reaction was 3.27, and for the teacher's reaction, 3.53. Thus both reactions fell within the range of "acceptance - enthusiasm." In no case was a reaction of "dislike" recorded. Generally,

the most negative reactions expressed seemed to be tied in with a feeling of the students that the exercise was difficult. The teacher reported some lively discussions evoked by diverse interpretations of the exercise. It would seem, then, in very preliminary and tentative fashion, that the curriculum was rather promising in terms of motivation.

In conclusion, I would come around full circle to the appelation given E. L. Thorndike's article on reading as reasoning as "the benchmark for research on the reading process" (Roberge & Craven, 1981).

As long ago as 1917 Thorndike stated:

> Understanding a paragraph is like solving a problem in mathematics. It consists in selecting the right elements of the situation and putting them together in the right relations, and also with the right amount of weight or influence or force for each. The mind is assailed as it were by every word in the paragraph. It must select, repress, soften, emphasize, correlate and organize, all under the influence of the right mental act or purpose or demand.

Perhaps it is more important to challenge students how to think than to teach them what to know.

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Conceptualization and Comprehension

Table 1

CHART OF EXERCISES

Teacher _____ Class _____

Exercises	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Dates used	2/28	2/29 2/30	3/5	4/5	3/8	3/21	3/19	3/12	3/14	3/19	4/4	3/16	3/20	3/28 3/29	4/2 4/3
Reactions	A/a	E/e	E/e	E/e	T/a	E/e	A/t	T/a	E/e	E/e	A/a	T/e	E/e	T/a	E/a
Comments	At first glance - mixed answers	Students worked diligently for the full period.	Students brought the 1st. list with them. Good.	Students enjoyed the pictures & they interested them.	Because it was difficult they didn't put forth much effort.	Estimates were rough but the students found the exercise interesting.	Students found the exercise difficult. They were unsure of the relationships.	They were unable to get the relationships.	Acceptable, if the students - they were reluctant to work.	Poor. Improved overall performance when guided by the teacher.	Some were made diligent thought.	Because several answers were given the students felt unsure.	They enjoyed this exercise & found it rewarding to complete.	Students found the exercise interesting & challenging & somewhat frustrating.	Students found the exercise fun & they did not put forth as much effort as they will on the next anticipated.

Key: Estimated class reaction (general) - Teacher's observation

E - Enthusiasm (great)
A - Acceptance (good)
T - Tolerance (fair)
D - Dislike (poor)

enter here

Teacher's personal reaction

e - enthusiasm
a - acceptance
t - tolerance
d - dislike

enter here